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REMARKS

Foreign Priority

The acknowledgement, in the Office Action, of a claim for foreign priority under 35 U.S.C. § 119(a)-(d), and that the certified copy of the priority document has been received, is noted with appreciation.

Status Of Application

Claims 1-10 were pending in the application; the status of the claims is as follows:

Claims 1, 2, 5-7, and 10 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,613,782 to Mori et al (hereinafter the "Mori patent"); and

Claims 3, 4, 8, and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Mori patent.

Drawings

To date, no Notice of Draftsperson's Patent Drawing Review has been received. Applicants respectfully request receipt of this document when it becomes available. Please note that the original drawings filed in the patent application are "formal" drawings.

Claim Amendments

Claims 1 and 6 have been amended to more particularly point out and distinctly claim the present invention.

Claims 7 and 10 have been amended, respectively, to improve the grammar thereof. These changes to claims 7 and 10 are not required by the prior art and are unrelated to the patentability of the invention.

New claims 11-15 have been added to provide more a more adequate basis for protection of the present invention. No new matter has been added.

35 U.S.C. § 102(b) Rejection

The rejection of claims 1, 2, 5-7, and 10 under 35 U.S.C. § 102(b) as being anticipated by the Mori patent, is respectfully traversed based on the following.

Claims 2 and 5 depend from independent claim 1, and claims 7 and 10 depend from independent claim 6. Accordingly, the following discussion of claims 1 and 6 applies equally to claims 2, 5, 7, and 10.

Claims 1 and 6 are directed towards actuators comprising a displacement element and a displacement expander. The actuators of claims 1 and 6 also include a driver for driving the displacement element such that oscillations of said displacement element are restrained by oscillations of said displacement expander.

The Mori patent is directed towards an actuator that includes a pair of piezoelectric devices and a resultant motion mechanism. However, the Mori patent fails to disclose a driver for driving the piezoelectric devices such that oscillations of the resultant motion mechanism restrain oscillations of the piezoelectric devices. Instead, the resultant motion mechanism of the Mori actuator is for transmitting the displacement, or oscillations, of the piezoelectric members (see, for example, col. 5, lines 42-46). In several figures of the Mori patent, such as Fig. 11, the resultant motion mechanism is modeled as a group of rigid links, which are described at col. 7, lines 27-30, as being suitable for transmitting with "high fidelity" the displacements of the piezoelectric members to the driving element. Thus, the Mori patent teaches using the displacements of the piezoelectric member for driving a driven element, rather than *restraining* the oscillations of the piezoelectric elements with oscillations of the resultant motion mechanism. Therefore, the Mori patent fails to disclose or even suggest providing a driver for driving a displacement element such that oscillations of the displacement element are restrained by oscillations of a displacement expander. Since the Mori patent fails to disclose all of the limitations of claims 1 and 6, the Mori patent cannot anticipate claims 1 and 6, respectively.

Since claims 2, 5, 7, and 10 each depend from claim 1 or claim 6, the Mori patent cannot anticipate claims 2, 5, 7, and 10 for at least the reasons discussed above regarding claims 1 and 6.

Accordingly, it is respectfully requested that the rejection of claims 1, 2, 5-7, and 10 under 35 U.S.C. § 102(b) as being anticipated by the Mori patent, be reconsidered and withdrawn.

35 U.S.C. § 103(a) Rejection

The rejection of claims 3, 4, 8, and 9 under 35 U.S.C. § 103(a), as being unpatentable over the Mori patent, is respectfully traversed based on the following.

Claims 3 and 4 depend, directly or indirectly, from claim 1 and claims 8 and 9 depend, directly or indirectly, from independent claim 6. Accordingly, a review of claims 1 and 6 is essential to an analysis of the Section 103 rejection of claims 3, 4, 8, and 9.

As discussed above, claims 1 and 6 include a driver for driving the displacement element such that oscillations of said displacement element are restrained by oscillations of said displacement expander; however, the Mori patent fails to suggest providing a driver for driving a displacement element such that oscillations of the displacement element are restrained by oscillations of a displacement expander. Instead, the Mori patent teaches away from the present invention by teaching that piezoelectric elements should be used "having a laminate structure to obtain great displacement" (col. 2, lines 64-65) and said displacement should be transmitted with "high fidelity" to the driving element for driving a driven member, rather than restrained. Therefore, since the Mori patent fails to disclose or suggest all of the limitations of claims 1 and 6, the Mori patent cannot render obvious claims 1 and 6, respectively.

Since each of claims 3, 4, 8, and 9 depends from claim 1 or claim 6, the Mori patent cannot render obvious claims 3, 4, 8, and 9 for at least the reasons discussed above with regard to claims 1 and 6.

Further, the indication, in the Office Action, that it was well known in the art to drive piezoelectric elements near their resonant frequencies is noted. However, it is respectfully pointed out that claims 3, 4, 8, and 9 are directed towards driving a displacement element at a frequency near the simple natural frequency of a respective displacement *expander*, not the natural frequency of the displacement element itself. The Mori patent is silent with regard to what frequency at which the piezoelectric elements are driven and, for this reason as well as those discussed above, the Mori patent cannot render obvious claims 3, 4, 8, and 9.

Accordingly, it is respectfully requested that the rejection of claims 3, 4, 8, and 9 under 35 U.S.C. § 103(a), as being unpatentable over the Mori patent, be reconsidered and withdrawn.

New Claims

New claims 11-15 have been added to provide a more adequate basis for protection of the present invention. No new matter has been added.

Of the new claims, claim 11 is an independent claim, and claims 12-15 depend, directly or indirectly, from claim 11.

Claim 11 is directed towards an actuator comprising a displacement element and a displacement expander. The actuator of claim 11 also includes "a driver for driving said displacement element such that said specific displacement of said displacement element is restrained by contractions or expansions of said displacement expander." However, as pointed out above, the Mori patent fails to disclose or suggest a driver for driving a displacement element such that oscillations of the displacement element are restrained by oscillations of a displacement expander. In addition, the Mori patent fails to disclose or

suggest a driver for driving said displacement element such that said specific displacement of said displacement element is restrained by contractions or expansions of said displacement expander. Therefore, since the Mori patent fails to disclose or suggest all of the limitations of claim 11, the Mori patent cannot anticipate or render obvious claim 11.

Since claims 12-15 depend, directly or indirectly, from claim 11, the Mori patent cannot anticipate or render obvious claims 12-15 for at least the same reasons discussed above with regard to claim 11.

CONCLUSION

Wherefore, in view of the foregoing amendments and remarks, this application is considered to be in condition for allowance, and an early reconsideration and a Notice of Allowance are earnestly solicited.

This Amendment increases the number of independent claims by one to three from two independent claims, increases the total number of claims by five to fifteen from ten, and does not present any multiple dependency claims. Accordingly, no fee based on the number or type of claims is currently due. However, if a fee, other than the issue fee, is due, please charge this fee to Sidley Austin Brown & Wood's Deposit Account No. 18-1260.

If an extension of time is required to enable this document to be timely filed and there is no separate Petition for Extension of Time filed herewith, this document is to be construed as also constituting a Petition for Extension of Time Under 37 C.F.R. § 1.136(a) for a period of time sufficient to enable this document to be timely filed.

Any other fee required for such Petition for Extension of Time and any other fee required by this document pursuant to 37 C.F.R. §§ 1.16 and 1.17, other than the issue fee,

and not submitted herewith should be charged to Sidley Austin Brown & Wood's Deposit Account No. 18-1260. Any refund should be credited to the same account.

Respectfully submitted,

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

The following is a marked-up version of the changes to the claims which are being made in the attached response to the Office Action dated October 3, 2001.

IN THE SPECIFICATION:

The paragraph beginning at page 1, line 18, and ending at page 2, line 3:

> When the former single plate displacement element is used, there is scant internal loss of the displacement element itself, since the drive force generated by the displacement element is transferred to the elastic member without attenuation. Accordingly, the drive efficiency is high. However, since the total surface area of the displacement element is small and the impedance is high, the drive voltage must be increased in order to increase the output. Particularly when used in a portable device, a several batteries must be used, or a booster circuit must be used. For this reason such as a solution is contrary to the demand for lower cost and more compact and lighter weight devices.

The paragraph beginning at page 2, line 22, and ending at page 3, line 4:

> These and other objects ~~art~~ are attained by one aspect of the present invention providing a displacement element for generating a specific displacement by piezoelectric effect, a displacement expander for transmitting the displacement of the displacement element and expanding this displacement, a transmitter for transmitting the displacement expanded by the displacement expander to a driven member, and a presser for pressing the transmitter against the driven member, wherein the oscillation

of the displacement element is restrained by the oscillation of the displacement expander.

The paragraph beginning at page 8, line 10, and ending at page 8, line 24:

When two mutually intersecting and independent movements are combined, the intersection point describes a path in accordance with an elliptical movement method (Lissajous method). In the actuator of the present embodiment, various paths can be obtained by changing the phase difference and amplitude of the drive signals used to drive the first piezoelectric element 10 and the second piezoelectric element 10'. The rotational direction, rotational speed, rotational force (torque) and the like of the rotor 40 can be controlled by controlling the path of the tip 20. Specifically, the rotational speed is increased if the diameter of the path of the tip 20 is increased in a tangential direction relative to the rotation direction of the rotor 40. The rotational force is increased if the diameter f of the path of the tip 20 is increased in a normal line direction relative to the rotor 40. Furthermore, if the phase is reversed, the rotational direction can be reversed.

The paragraph beginning at page 9, line 17, and ending at page 9, line 25:

The relationship between the frequency of the drive signal and the displacement (amplitude) X1 and X2 are shown in FIGS. 7a and 7b. As can be understood from FIG. 7a, at a specific frequency f ~~(f=k2/m2)$^{1/2}$~~ (f=(k2/m2)$^{1/2}$), the displacement X1 of the piezoelectric elements 10 and 10' becomes zero [0]. In the present embodiment, the frequency f at which the displacement X1 of the piezoelectric elements 10 and 10' becomes zero is used to drive the piezoelectric elements 10 and 10'. In equation (1) above, the condition under which the displacement X1 of the piezoelectric elements 10 and 10' becomes zero is stated below

The paragraph beginning at page 10, line 7, and ending at page 10, line 10:

> The displacement X2 of the elastic members 25 and 25' ~~are~~ is equal to the extension from equation (4) when the drive force of the piezoelectric elements 10 and 10' ~~are~~ is statically added to the elastic members 25 and 25'.

The paragraph beginning at page 10, line 11, and ending at page 10, line 16:

> The negative sign on the displacement ~~X2(=F0/k2)~~ X2 (= -F0/k2) of the elastic members 25 and 25' reflects that the phase of the elastic members 25 and 25' are the opposite phase of the drive force (exciting force) of the piezoelectric elements 10 and 10'. That is, the oscillation of the elastic members 25 and 25' ~~nullify~~ nullifies the oscillation of the piezoelectric elements 10 and 10'.

The paragraph beginning at page 12, line 17, and ending at page 12, line 22:

> Although the present invention has been fully described by way of examples with reference to the accompanying drawings, it is to be noted that various changes and modifications are apparent to those skilled in the art. Therefore, unless such changes and modifications depart from the scope of the present invention, they are to be ~~construes~~ construed as being included therein.

IN THE CLAIMS:

1. (Once Amended) An actuator comprising:

a displacement element for generating a specific displacement;

a displacement expander for transmitting the displacement of said displacement element and expanding the displacement;

a transmitter for transmitting the displacement expanded by said displacement expander to a driven member; ~~and~~

a presser for pressing said transmitter against the driven ~~member,~~ member; and

a driver for driving the displacement element such that oscillations ~~wherein the oscillation~~ of said displacement element ~~is~~ are restrained by ~~the oscillation~~ oscillations of said displacement expander.

6. (Once Amended) An actuator comprising:

a first displacement element for generating a specific displacement;

a second ~~displace~~ displacement element for generating a specific displacement of which a direction is cross to a direction of the specific displacement of said first displacement element;

a first displacement expander, which is connected in series to said first displacement element, for transmitting the displacement of said first displacement element and expanding the displacement;

a second displacement expander, which is connected in series to said second displacement element, for transmitting the displacement of said second displacement element and expanding the displacement;

a tip member, which is arranged at an intersection end of said first and second displacement elements, for transmitting the displacement expanded by said first and second displacement expanders to a driven member; ~~and~~

a presser for pressing said tip against the driven ~~member,~~ member; and

a driver for driving each of said first and second displacement elements such that oscillations ~~wherein the oscillation~~ of said first and second displacement elements are restrained by ~~the oscillation~~ oscillations of said first and second displacement expanders.

7. (Once Amended) An actuator as claimed in claim 6, wherein the spring constants of said first and second displacement expanders ~~is~~ are respectively less than the spring constants of said first and displacement elements.

10. (Once Amended) An actuator as claimed in claim 6, wherein said first and second displacement elements are respectively a laminate-type piezoelectric elements.

Claims 11-15 have been added.